

Outdoor AP-270 Planning and Installation Best Practices

General Guidance for Staging, Design, and Installation

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In most cases, as partners and customers move from previous experience with older outdoor installations of access points to newer AP-27x 11ac access points, a good deal of time and cost can be saved. Gone are the days of laborious antenna weatherization, complicated AP and antenna mounts, and what amounted to hours of time per AP to prep, install, and deploy. The guidance below is a very general framework on the basic processes in planning for the design, preparation, staging, and installation of the Aruba AP-27x APs. While this will not address and encompass every single opportunity or deployment, it should serve as a fairly comprehensive guide into the basics of planning, staging, and deploying Aruba's AP-270 series of APs.

This tech guide will not cover any outdoor design principles. Please read through the last section at the bottom of this document for resources on outdoor design references located in Aruba's 'Outdoor MIMO for Wireless Networks' validated reference design (VRD).

As part of any outdoor wireless design, the first thing that has to happen is that required coverage areas must be identified. Then available mounting assets must be identified upon which hardware will be installed. Available mounting locations will, to a great extent, dictate what the design will be based on the coverage requirements, and they will most always be either wall mounted, corner mounted, or pole mounted. There are occasions where APs will be placed on roof tops, or in specialized structures built to accommodate special requirements, but the vast majority fall under the main categories described below.

Ideally, mounting heights should be in the neighborhood of 16-30 feet above ground level. This usually allows clearance for equipment and vehicles when needed, but keeps some of them serviceable with an extension ladder or a small, mobile scissor lift. It also provides reliable line of sight to the client devices. If mounted too low, a crowd can attenuate the RF very quickly, which shrinks the coverage area of the AP.

This section includes the following topics:

- [Wall Mounting on page 7](#)
- [Corner Mounting on page 8](#)
- [Pole Mounting on page 9](#)
- [Roof Mounting on page 10](#)
- [Verify Cables Runs and Distances to Cabling Closets on page 11](#)

Wall Mounting

Wall mounting is one of the most common mounting locations, simply due to close proximity to internal network resources located within a building (power, switch closets, etc.), as well as the fact that, barring any aesthetic or community review issues, mounting APs on the main building is one of the fastest installation methods to utilize. This also usually involves a hole being drilled through the wall that allows the Ethernet cable to pass through to the AP. As seen in the pictures below, if using the AP-275 or 274, the AP-270-MNT-V1 and AP-270-MNT-V2 are great brackets to use as they provide a covered shroud for the cable to be hidden under. If using the AP-277, the AP-270-MNT-H1, or the AP-270-MNT-H2 mounts will allow for the AP-277 to face out towards the coverage area (more about mounts are covered in [Staging of AP Mounts on page 14](#)).

Wall mounting does have some caveats of which to be aware. The AP-275 is a powerful AP, and if it is mounted to the wall (see [Figure 1](#)), some of the RF from outside can bleed in to the building and cause additional interference or coverage issues for clients. If using the AP-275 on a wall mount, take care to plan for this (either validate the wall will sufficiently attenuate the RF, or that there is sufficient coverage inside to compensate clients to keep them from roaming outside).

When wall mounting an AP-275, as seen in [Figure 1](#), it essentially makes the 275 emulate a 180deg antenna pattern (as the other 180deg of coverage is sent into the wall). If wall mounting a 277, seen in [Figure 2](#), most of the RF is radiated away from the wall providing better coverage with less interference into the building.

Figure 1 AP-275 Wall Mount Coverage

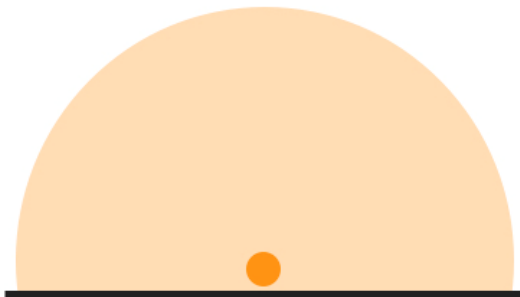
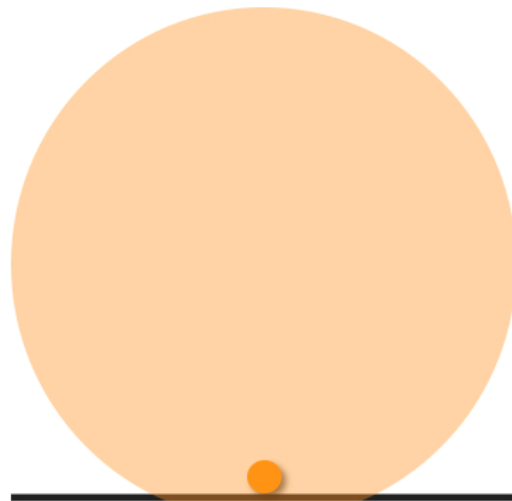


Figure 2 AP-277 Wall Mount Coverage



Corner Mounting

Corner mounting is a type of wall mounting, but instead is mounted near or at the point of a corner of a wall or building. This allows for 270deg of coverage from the AP, effectively covering two sides of a building. For this type of mount, the AP-270-MNT-V2 is used, as it mounts directly to a 3rd party bracket ([Figure 4](#)) that allows for corner installations (Samsung SBP-300KM).

Corner mounting does not share the same caveats as wall mounting, in that there is far less penetration of RF into the wall and interior space due to the angle of incidence against the wall from the AP. However, more care does need to be taken in terms of capacity, interference, and coverage regarding interference since a corner mounted AP will project RF in more directions and cover more space, and thus will pick up more interference.

When corner mounted, the AP-275 emulates a 270deg antenna ([Figure 3](#)), as the last 90 degrees is obstructed by the building. It would not be common to mount an AP-277 on a corner, so it is not addressed in this document.

Figure 3 AP-275 Corner Mount Coverage

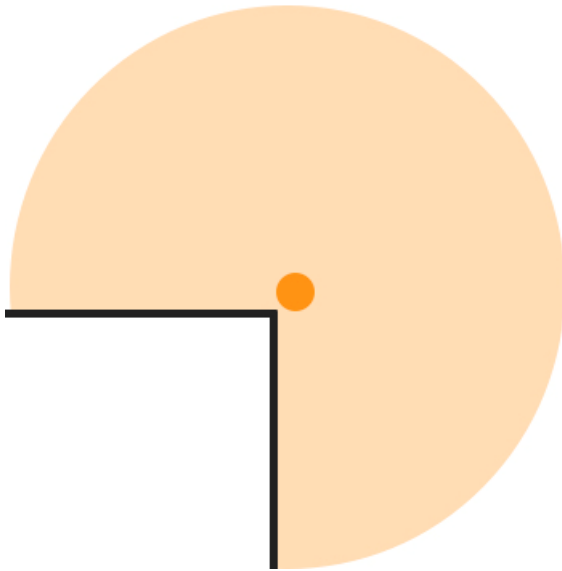
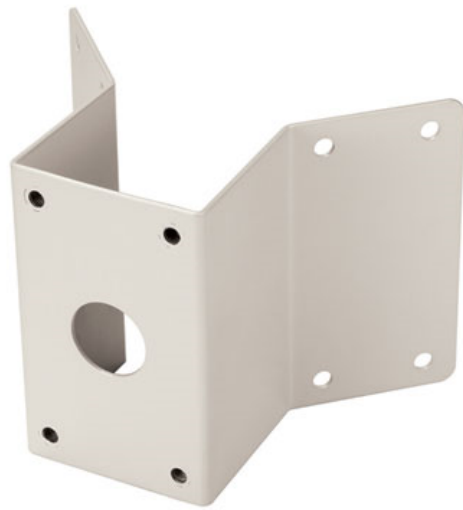


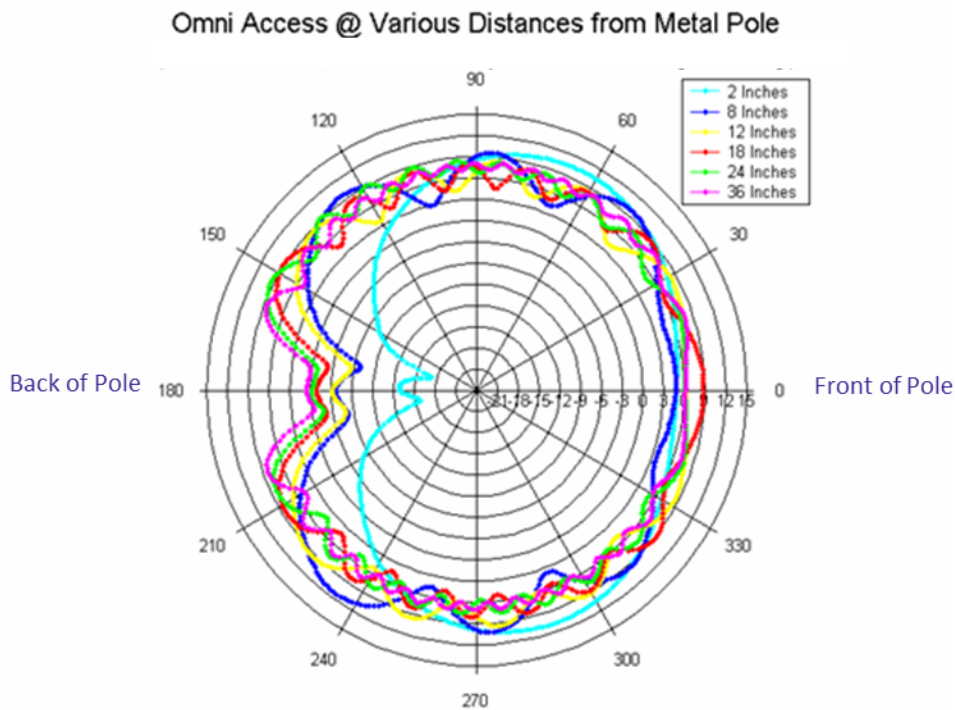
Figure 4 Corner Bracket



Pole Mounting

Pole mounting is more common when designing for outdoor coverage located away from buildings and usually involves mesh (though some installations will pull copper or cabling to each light pole). When pole mounting, the goal is to usually provide 360 degrees of coverage around the pole. However, if the AP is mounted too close to the pole, the pole will create a shadow behind the AP where the pole interferes with the RF. To address this, the AP-MNT-270-V1, which is an 18" mounting arm, should be used as it puts enough space (~12") between the AP and pole to minimize the shadow cast (see [Figure 5](#)). This should be noted when looking at other solutions, if the AP is too close to the pole, the RF behind the AP will be highly attenuated.

Figure 5 RF Attenuation from Pole



If a directional solution is desired, the AP-277 should be deployed, using the AP-270-MNT-H1 if articulation is needed, or the AP-270-MNT-H2 if no articulation is needed. If articulation is needed, for example to direct an AP-277 in a direction other than perpendicular to the wall, the AP-270-MNT-H1 allows for articulation either up or down or left or right of the AP when wall mounted.

All AP mounts include a zip tie to temporarily hold the mount in place on the pole. Then using the two included band clamps, run them around or through the mount to tighten and secure the mount to the pole. From there, the AP slots into the end and a single screw attaches the AP to the mount. See [Figure 6](#) and [Figure 7](#) below for examples. This allows for a completely one-man installation crew to install APs.

Figure 6 AP-275 Pole Mounted



Figure 7 AP-277 Pole Mounted



Roof Mounting

Roof mounting APs is a viable deployment strategy, assuming a few requirements are met and some caveats are accounted for or are avoided. In most cases, non-penetrating roof mounts ([Figure 8](#)) are used to prevent the need for any re-engineering or inspections or re-certifications by city or building inspectors. Once a non-penetrating roof mount is selected, the next step is to make sure that the AP can cover the areas required. In many cases, rooftops have knee walls that extend up, so APs must be mounted above or over the knee wall, or APs can be mounted to the knee wall themselves and cables installed over the knee wall into an existing roof penetration for cabling (either directly to an AP-277 or to antennas connected to an AP-274 on the mount, similar to what is seen in [Figure 9](#)).

Figure 8 Non-Penetrating Roof Mount Example

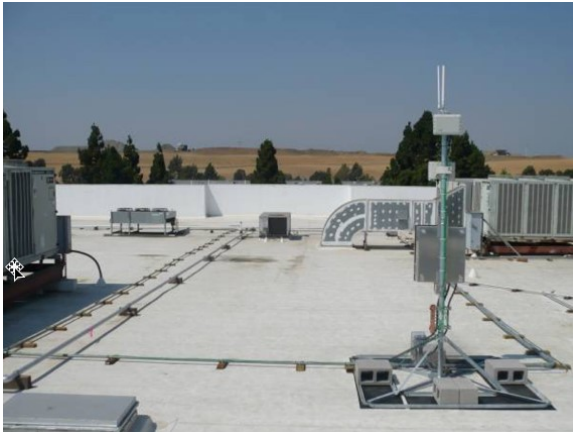


Figure 9 Knee Wall Installation over to External Antennas



Verify Cables Runs and Distances to Cabling Closets

When mounted to a building, the AP must be located within spec of Cat5 cable to a switching closet and power source (within ~100m). It is recommended in most cases to use outdoor rated power injectors, as they include built in surge protection to ground and will protect the internal network from surges or lightning strikes. However, if indoor switches or injectors are used instead, in most cases there are enough network closets in a build that any exterior location can be reached. However, if not, the installation of additional switches may be required. Additionally, the use of Powered Fiber solutions

(http://www.arubanetworks.com/assets/psd/PSO_TECConnectivity.pdf) or fiber-to-copper transceivers can be used. Mid-Spans are regenerative as well, so in some cases you can string power injectors back to back to reach the last leg.

Additionally, when APs are mounted on the exterior of a building and powered by internally located switches or injectors, in-line surge suppressors on the Ethernet cable may be desired or required (check local codes). These will protect the indoor network at the ingress point, where grounding occurs at the spot where the outdoor network cable enters the building. Local CE expertise should be consulted to determine the best course of action in these situations.

This section includes the following topics:

- [Staging of AP Hardware on page 13](#)
- [Staging of AP Mounts on page 14](#)
- [Prep for Any Cable Glands or Flex Conduit on page 16](#)

Staging of AP Hardware

When starting a large outdoor wireless installation, the best practice is to bring all hardware into the lab, connect to all hardware, upgrade the software and load the configuration, do all labeling, etc. The reason is all work done in a lab, in bulk, is far more cost effective than doing this work outdoors while on ladders or lifts where the labor and equipment rental costs are much higher. Previously though, it was a very labor-intensive process to open each box, pull out each AP, connect it, attach antennas, install mounting brackets, etc. And what resulted then was a cumbersome pile of hardware to be deployed ([Figure 10](#)) on the floor that could be confusing for non-Wi-Fi-trained installers, and was hard to transport in bulk.

Figure 10 *Old Staging*



With the AP-27x family, all APs are shipped in a box where connectors and access to the AP is easy, without ever having to remove the AP from the box ([Figure 11](#)). Also within easy reach are the Ethernet cable glands, the USB serial cable, etc. All that is needed to stage the AP-275, is to rip open the plastic to access the connectors, remove the port covers, and plug in. The AP is never removed from the box, all labeling and firmware upgrades and configuration can be done with the AP still in the box, and once work is complete, the box can be closed up and handed to the installers for easy transport. And since the AP mounts only require a single screw to attach the AP to the mount, the mounts are not required to be mounted to the AP before installation. Instead, the mounts are installed on the wall or pole separately, and then the AP is installed with a single screw. Simple.

Figure 11 *AP-275 New In Box*



Staging of AP Mounts

The mounts being as simple as they are, in most cases they will just be field installable out of the box. The AP-270-MNT-H1 does require a single bolt to attach the two pieces together, however, the pieces are sufficiently large that it could be done in the field. Lab assembly might be advisable should there be large numbers of AP-270-MNT-H1 mounts. If wall or corner mounted, the holes can be drilled into the wall using the installation templates provided, and then the mount is installed on the wall. Everything that would be needed is contained within the boxes of the mounts (mount, drill guide, hardware, etc).

Figure 12 *AP-270-MNT-V1 – 18" Mounting Arm Bracket*

Good for wall or pole mounting the AP-275.



Figure 13 *AP-270-MNT-V2 – 12" Mounting Arm Bracket*

Good for Wall or Corner Mounting the AP-274/275.



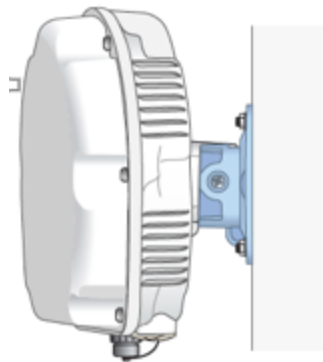
Figure 14 *AP-270-MNT-H1 – Articulating Mounting Arm Bracket*

Good for wall or pole mounting the AP-277, or ceiling mounting an AP-274/275.



Figure 15 *AP-270-MNT-H2 – Non-Articulating Mounting Arm Bracket*

Good for wall or pole mounting the AP-277, or ceiling mounting an AP-274/275.



For a pole mount, the mount is first secured to the pole using the included zip tie, as a temporary hold while the metal band clamps are installed. Once the metal band clamps are installed, the zip tie should be cut off and removed.

Figure 16 AP-270-MNT-V1 Contents



Figure 17 AP-270-MNT-H1 Contents



Prep for Any Cable Glands or Flex Conduit

Every AP-27x includes (2) Ethernet cable glands ([Figure 18](#)). These glands must be slid over the Ethernet cable before the cable ends are terminated as the glands are solid to meet our IP66/67 ratings. As such, when using the included glands, the Ethernet cables must be field terminated (this is something that every outdoor AP installer should be able to do).

If field termination is not possible, or if there is a desire to not have exposed Ethernet cables, the AP-27x APs support the installation of Flex Conduit ([Figure 19](#)) using 3rd party parts (see appendix for links). In this case, the conduit and M20-to-1/2" NPT adapter allow terminated connectors through to the AP. This also has the added benefit of protecting the Ethernet cable as well.

Figure 18 Cable Gland Assembly

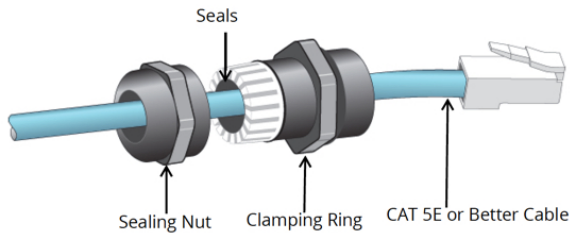


Figure 19 Flex Conduit Assembly



Additionally, if the desire is to have pre-terminated cables used, or there is a need to stage connections and glands, the use of outdoor cable boxes can be used (see [Figure 20](#) and [Figure 21](#) for examples).

Figure 20 Cat5 Gang Assembly



Figure 21 Finished Product



This section includes the following topics:

- [Wall Mounted AP Installation on page 18](#)
- [Corner Mounted AP Installation on page 18](#)
- [Pole Mounted AP Installation on page 19](#)
- [Other Considerations on page 20](#)

Wall Mounted AP Installation

In this case, pictures are better than words. Basically, after the core penetration for the Ethernet cable is located and drilled, the four mounting holes are drilled into the wall or mounting surface to attach the mount to the wall. Use the mounting template when using the AP-270-MNT-V1/V2 such that the arm straddles the core location for the Ethernet cable penetration, so that the Ethernet cable comes out under the arm. Check the level of the mount before securing to the wall, test the Ethernet cable for continuity, attach the AP to the arm using the two screws on the end, connect the cable to the AP and verify power using the LED, dress the cables and clean up any mess. Installation time should be 15-30 minutes.

The installation for the AP-270-MNT-H1/H2 is the same process, but there is no protected cover for the Ethernet cable, so a proper drop loop should be applied to the Ethernet ingress location.

Figure 22 *Drill Mounting Holes*



Figure 23 *Attach Mount to Wall*



Figure 24 *Attach AP to Mount*

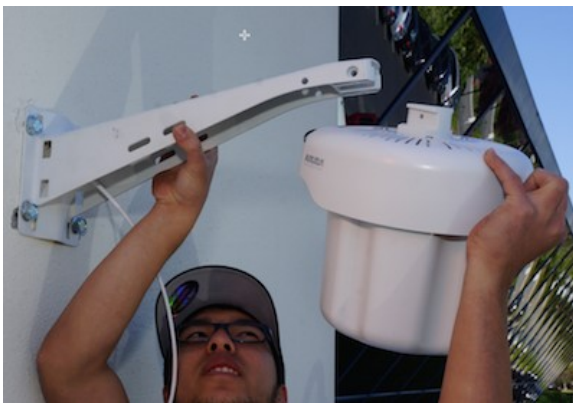


Figure 25 *Connect AP to Network*



Corner Mounted AP Installation

With corner mounts, the same process will be used, however, the Samsung SBP-300KM will be attached to the wall at the corner. From there, the AP-270-MNT-V2 can be bolted directly to the SBP-300KM. Since most cables won't be coming out of the exact corner, there is room under the SBP-300KM to plumb the cable through the large hole in the center that will be under the arm of the AP-270-MNT-V2. After that, the same installation process for wall mounting applies to the AP.

Pole Mounted AP Installation

Pole mounting in many ways is much, much easier than wall mounting as no holes or cores for the mounts need to be drilled. In some cases, there may be a core through a pole for power and Ethernet should it be delivered within the pole, otherwise it can come out of the top cap of the pole, or what ever cable routing solutions are in place for the pole that the mount and AP are being installed on.

When attaching the mount to a pole, use the included zip tie to secure the mount to the pole with enough tension to secure the mount to the pole but allow for some movement for adjustment and alignment. Once zip tied, use the two included band clamps to firmly secure the mount to the pole, one across the top and the other across the bottom. From there, attach the AP to the mount using the two screws at the end of the mount, and connect the Ethernet cable. See and [Figure 27](#) for a detailed look at the two different types of mounts.

Figure 26 AP-275 Pole Mounted Close-Up



Figure 27 AP-277 Pole Mounted Close-Up



Other Considerations

When doing outdoor installations, other factors and considerations should be taken in to account. While not a complete list, below are some other bullets of information that should be taken in to account when installing Aruba's AP-27x family of APs:

- Always use outdoor-rated UV resistant Cat5e/Cat6 cabling. Temperatures can wreak havoc with non-outdoor rated cables, and if the cables are exposed to sunlight, the jacket will degrade over time from exposure to UV light, which will eventually create connectivity issues and results in costly cable replacements.
- Always seek out local CE and experts in regional code. They will have the final answers in what is and is not permissible in regards to plumbing cabling, requirements to core through an exterior wall, etc.
- Stage as much of the preparation and installation inside a lab or staging area. The costs to support lifts and outdoor equipment are high enough to easily justify some extra time staging gear. Every hour saved outside in a lift can be worth thousands of dollars in labor, equipment rentals, permits, etc.
- No outdoor APs are built to withstand a direct lightning strike. However, it is critical that all outdoor APs be properly grounded to provide a viable path for the lightning surge to travel to ground so that it does not go into the building network. There is a ground lug on the back side of the AP that is to be used to attach a proper ground to.
- When using the AP-274 with external antennas, in cases where external antennas must be used (long distance mesh, mesh with client access, etc.), lightning arrestors are ONLY required on cables LONGER than 2 meters. Cables 2 meters and under no longer require lightning arrestors. The APs are built with enough surge resistance to handle atmospheric static buildup on 2m cables.
- While general guidance can be given, any use of electricity and electrical connections should be sourced to local CE for proper local governance on building code requirements and proper installation.
- This guide does not cover easements, mounting resource ownership identification, etc. Please read through Chapter 10 and 12 of Aruba's 'Outdoor MIMO for Wireless Networks' VRD for more information on those topics.

While this is not a comprehensive guide, this should give some indication as to the ease and efficiency of installation with the Aruba AP-27x product line. The simplicity of the product and the mounts completely takes the difficulty and complexity out of the equation, while allowing for not only a quicker execution time, but also a more aesthetically pleasing solution that minimizes visual impact while providing the best performance of any outdoor Wi-Fi solution on the market today.

Resources:

- <http://community.arubanetworks.com/aruba/attachments/aruba/Aruba-VRDs/34/1/Outdoor-MIMO-VRD.pdf>
- <http://community.arubanetworks.com/t5/tkb/v2/page/blog-id/Aruba-VRDs>
- <https://community.arubanetworks.com/>
- <http://www.commscope.com/Solutions/Powered-Fiber/>
- <https://www.ventev.com/>
- [Ethernet Connector Couplers \(source examples\):](#)
 - [M20 to 1/2" NPT - https://www.threadtoolsupply.com/aluminum-thread-adapter-m20-12npt.html](https://www.threadtoolsupply.com/aluminum-thread-adapter-m20-12npt.html)
 - [M16 to 1/2" NPT - https://www.threadtoolsupply.com/aluminum-thread-adapter-m16-12npt.html](https://www.threadtoolsupply.com/aluminum-thread-adapter-m16-12npt.html)